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APPLICATION FOR PATENT OF INVENTION

(21) No. **74 19973**

(54) ARRANGEMENT FOR BIOLOGICAL ANALYSES, FOR EXAMPLE ON BLOOD SERUM AND OTHER MATERIAL, COMPRISING CONTAINERS AND MEANS FOR TAKING MULTIPLE SAMPLES AND ASSURING THE UNIFORMITY OF SAMPLING

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(72) Invention of:

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In the current practice of biological analyses in hospitals and other establishments, a set-up permitting conducting several tests simultaneously is required more and more frequently, for different types of analyses such as those which involve electrophoresis or thin-layer chromatography, for example on biological liquids such as blood serum. To successfully conduct multiple and simultaneous analyses, it is necessary to obtain samples of roughly constant measure to be deposited on the support means designed to conduct the analysis. Processes known up until now have not given a very satisfactory result, or require time-consuming and thus costly operations.

According to the processes already known for creating arrangements for multiple and simultaneous analyses, multiple containers are used for the biological liquid samples to be examined, and instruments in the shape of a comb or the like are used, which permit simultaneously sampling from containers arranged side by side and suitably spaced, for depositing the samples on the support means designed to conduct the analysis. The invention concerns an improvement to arrangements of this type and provided for this purpose, which, by means of the invention, combines simplicity and thus low cost with the reliable satisfaction of requirements with regard to the precision and constancy of the measurements.

Essentially, the containers for the samples to be taken for the tests are produced on surfaces or pads bearing a porous layer capable of absorbing the liquid to be examined from classical capillary tubes used for the transfer, and also capable of uniformly distributing the liquid over the appropriate surface

circumscribed in a suitable manner, and also permitting a uniform sampling by means in the shape of a comb or similar shape that one rests on these pads on the surfaces that can retain the liquid.

In practice, in order to form several pads of porous layers, one can use continuous sheets having a porous layer, by creating a subdivision of this layer into separate pads having the desired surfaces and producing a desired spacing or step. The subdivision can be carried out in any appropriate manner. For example, one can proceed by removing parallel and evenly spaced strips of material, forming two groups of strips perpendicular to one another or rather several groups of criss-crossing strips, to outline zones having the desired surface which forms said porous layers of containers. As a variation, the subdivision can also be produced by neutralizing the porous layer along strips that outline the surfaces of such a layer, designed to form containers in the shape of a pad, it being understood that the neutralization is capable of preventing the propagation of the liquid into the [adjacent] porous layer; one can obtain this neutralization by an appropriate treatment inducing an impression by means of trimming, by the effect of heat or other treatment, depending on the nature of the porous layer.

The porous layer designed for the formation of pads may be made up of fibers distributed over a support and attached in an appropriate manner onto the latter; the fibers and the support must be inert with regard to the liquids to be absorbed and the analyses to be conducted on these liquids. The fibers can be synthetic fibers, and the layer can be made up, for example, of polyvinyl chloride

fibers deposited by flocking. The absorbent layer constituting a pad is capable of distributing the biological liquid received from the transfer capillary tube in a uniform manner onto the appropriate surface, and it is able to return, i.e., provide, constant quantities of the liquid to the instrument in the shape of a comb or the like, which is used and has an appropriate porosity on the transfer surface, which renders this surface capable of retaining liquids, in particular dense and viscous liquids, such as blood serum, for example.

The absorption surface of combs of this type may be treated mechanically or chemically, in order to produce microslots able to retain the liquid in a quantitatively constant manner. Arrangements of this type assure the sampling of constant quantities in pads of the type described, and prevent a displacement of the liquid retained, even in the case of inclination of the absorption surface, or other stresses.

The invention will be better understood by the detailed description of one of its modes of embodiment, taken by way of illustration and without limiting character, which will be described by means of the attached drawings in which:

Figure 1 is a perspective view of a support for sample containers and an instrument in the shape of a comb for taking up the samples;

Figures 2 and 3 show in partial section and, for purposes of illustration, greatly enlarged, two modes of embodiment of supports and containers, obtained from the same material;

Figure 4 is a local section along line IV-IV of Figure 2.

In these figures, reference 1 designates a flat support of any type whatever, onto which one can attach more or less oriented fibers that form a uniform layer able to absorb the liquid by capillary action and porosity; one can obtain a layer of this type with very short synthetic fibers deposited by flocking on the support that appropriately contains an adhesive. The support, adhesive and fibers must be inert or in any case inactive with regard to the substances with which they come into contact. The uniform absorbent layer can receive the liquid to be examined with a uniform surface distribution and it can provide the liquid in roughly constant quantities, depending on the characteristics of the sampling instrument, as well as the quantities of liquid received by said layer.

The layer of uniform fibers is divided into several surface containers formed by clearly delimited zones of the absorbent layer. This subdivision can be carried out, as is shown in Figure 2, by drawing longitudinal and transverse lines 3, to define surface zones 5, rectangular or simply square section, of the absorbent layer. The different zones are clearly separated from one another and therefore there is no transfer of liquid from one of these zones to another. The surface size of these zones can be obtained with precision by a mechanical operation of removing material along lines 3.

According to the variant shown in Figure 3, the subdivision between different zones 5A of the absorbent layer is obtained without removal of material, but by inducing an impression in zones 3A along strips similar to strips 3, with modification of the characteristics of the fiber layer to render this layer incapable of transmitting traces of liquid by wetting from one zone 5A to another. The

impression can be simply an impression made by pressing, possibly with heat, to obtain a melted or nearly melted state or a surface plastification which changes the characteristics of the fibrous material of the layer with regard to its behavior with liquid substances. The impression can also be performed by application of substances able to produce the above-described changes, for example by application of sizing or in another way.

The liquids to be examined are introduced into the containers formed by absorbent surfaces 5 or 5A or the like, by means of metering devices, for example, and in particular by absorption from capillary tubes which serve for sampling. The fluid material is distributed uniformly throughout the surface of zones 5 or 5A, by being absorbed by the layer of fibers or similar elements.

Sampling is performed by means of instruments that can advantageously (but not exclusively) be made to permit a simultaneous sampling in several containers 5 or 5A of the same row.

A sampling instrument can comprise a support in the form of plate 12 bearing, in the manner of a comb, several teeth 14, the end of each of these teeth having (see in particular Fig. 2 and 4) a part 14A of a certain thickness able to absorb the liquid. In practice, the terminal surface of tooth 14 has a certain porosity produced by a mechanical or chemical treatment (polishing or chemical scouring, for example) to obtain a certain receptivity on the part of said surface, designated by reference 14A in the figure. The receptivity must be characteristically such that it offers the desired possibility of sampling liquids such as blood serum or other similar liquids, in particular those of equivalent

density and viscosity. Teeth 14 are spaced or stepped and have dimensions such that one tooth corresponds to each of absorbent containers 5 of the same row. Advantageously, one of the containers of the row (in general a transverse row) has a smaller dimension, this container being, for example, container 5X, the last in the row, shown in Figure 1; in an analogous manner, the instrument in the shape of a comb 12 also has a smaller tooth 14X; thus, errors of inversion are prevented as much as possible, i.e., inverting comb-shaped instrument 12 and consequently exchanging the sample relative to what has been noted on a support zone 1 next to each row of containers, the annotations relating to the samples introduced into the absorbent containers such as containers 5, 5A. It goes without saying that one can provide any other means for recording data concerning the samples, by using appropriate marks or identifying the different containers with a system of coordinates or in another way.

As goes without saying, and as results from the preceding, the invention is not at all limited to those modes of application and embodiment that have been especially envisioned; it embraces, on the contrary, all variants.

CLAIMS

1. Arrangement for biological analyses, comprising multiple containers for biological liquid samples to be examined, and instruments in the shape of a comb or the like which permit simultaneously sampling from containers arranged side by side and suitably spaced, to transfer the samples onto supports designed to conduct the analysis, which arrangement is characterized in that the containers for the samples to be taken for testing are comprised of surfaces or pads having a porous layer and capable of absorbing the liquid to be examined from classical capillary tubes used for transfer, distributing this liquid in a uniform manner over the surface appropriately circumscribed in a suitable manner, and permitting a regular sampling by the comb-shaped or similarly-shaped means that one rests on corresponding surfaces of said pads, capable of retaining the liquid.

2. Arrangement according to claim 1, further characterized in that one forms several pads with porous layers from a continuous sheet comprising a porous layer, by making a subdivision of said layer into separate pads having the desired surfaces and a desired spacing or step configuration.

3. Arrangement according to claim 2, further characterized in that the subdivision is effected by removing parallelly spaced strips of material, thus forming two groups of strips perpendicular to each other or by producing several groups of criss-crossing strips to outline zones having the desired surface that form said porous layers of containers.

4. Arrangement according to claim 2, further characterized in that the subdivision is conducted by neutralizing the porous layer in zones that outline the surfaces of such a layer designed to form the containers in the form of a pad, said neutralization being capable of preventing the propagation of the liquid in the porous layer and being obtained by the creation of an impression by means of trimming , by action of heat or in another way.

5. Arrangement according to either one of claims 1 and 2, further characterized in that the porous layer designed for the formation of pads is made up of fibers distributed and fixed onto a support; the fibers can be synthetic fibers, and the layer can produced, for example, by flocking.

6. Arrangement according to claim 1, further characterized in that the contact surface of the comb-shaped means is porous in order to retain liquids, in particular dense and viscous liquids, such as blood serum .

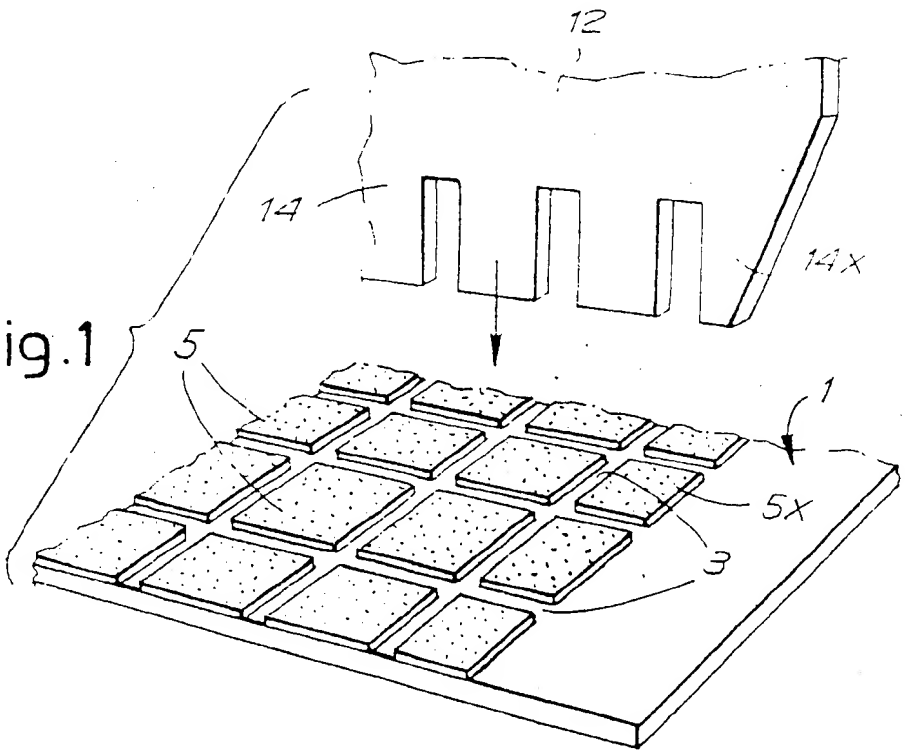


Fig.1

Fig.2

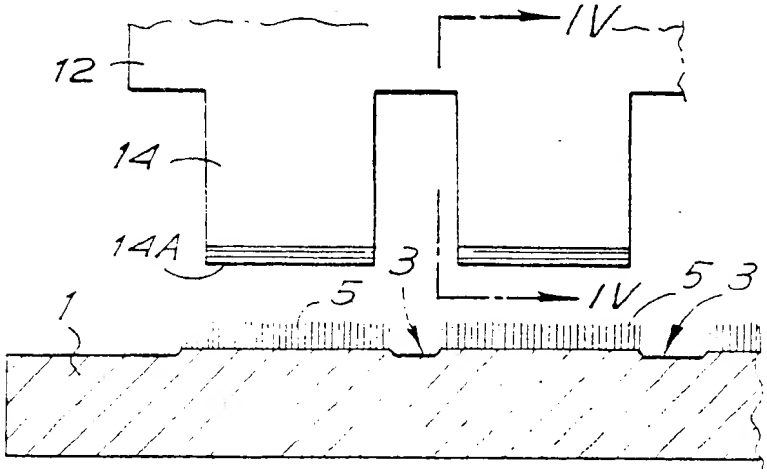
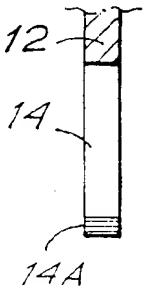


Fig.4



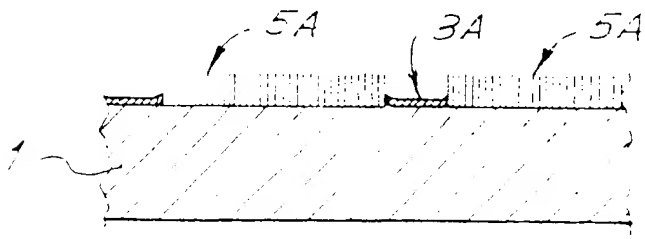


Fig.3